

CLAIMS

1. An apparatus for separating a mixed particulate material into particles of at least two different specific gravities, comprising:

a connecting hose connected at a first end to a top of a first separation chamber, and at a second end to a first end of a discharge tube; and

an air compressor adapted to provide compressed air into the discharge tube, whereby a vacuum is created through the venturi effect in the first separation chamber and connecting hose causing mixed particulate material to enter the first separation chamber through an angle of entry connection separating the mixed particulate material according to the specific gravity of the respective particulate material.

2. The apparatus for separating a mixed particulate material into particles of at least two different specific gravities according to claim 1, whereby the mixed particulate material is separated and at least a portion of a second particulate material having a lower specific gravity is ejected from the first discharge tube and a first particulate material having a higher specific gravity and the remaining second particulate material exits at a bottom of the first separation chamber.

3. The apparatus for separating a mixed particulate material into particles of at least two different specific gravities according to claim 1, wherein the angle of connection between the angle of entry connector and first separation chamber is at or about 45°.

4. The apparatus for separating a mixed particulate material into particles of at least two different specific gravities according to claim 1, further comprising:

a conveyor for transporting partially separated mixed particulate material to a second apparatus for further separating the mixed particulate material.

5. The apparatus for separating a mixed particulate material into particles of at least two different specific gravities according to claim 4, wherein the second apparatus for separating a mixed particulate material comprises:

a second discharge tube comprising:

an opening adapted to receive the transported partially separated mixed particulate material;

a first end; and

a second end; and

an air cone connected to the air compressor adapted to direct a flow of air into the second discharge tube, discharging at least a portion of the second particulate material with a lower specific gravity from the first end of the second discharge tube, and allowing the first particulate material with a higher specific gravity to exit the discharge tube at the second end.

6. The apparatus for separating a mixed particulate material into particles of at least two different specific gravities according to claim 4, wherein the second apparatus for separating a mixed particulate material further comprises:

a frame, adapted to be transportable, to which is attached the first discharge tube, the second discharge tube, and the conveyor, and further adapted to provide a container adapted to collect the first particulate material with a higher specific gravity after it exits the discharge tube at the second end.

7. The apparatus for separating a mixed particulate material into particles of at least two different specific gravities according to claim 1, further comprising:

an automated unloader valve, comprising:

a valve servo;

a level sensor; and

an unloader valve; and

a computer adapted to control operation of the automated unloader valve, wherein the computer is programmed to determine when to allow separated mixed particulate material to be discharged by operation of the automated unloader valve.

8. An apparatus for separating a mixed particulate material into particles of at least four different specific gravities, comprising:

an air compressor adapted to provide a first flow of air into a first mixed particulate material separating apparatus, whereby a first vacuum is created through the venturi effect in the first mixed particulate material separating apparatus, the first vacuum causing the mixed particulate material to enter the first mixed particulate material separating apparatus and separate the mixed particulate material into a first and second group of mixed particulate material by pulling at least a portion of the first group of mixed particulate material up and out of the first mixed particulate material separating apparatus and allowing the second group of mixed particulate material to fall from the first mixed particulate material separating apparatus;

the air compressor further adapted to provide a second flow of air into a second mixed particulate material separating apparatus, whereby a second vacuum is created through the venturi effect in the second mixed particulate material separating apparatus, the second vacuum causing the second group of mixed particulate material to enter the second mixed particulate material separating apparatus and separate the second group of mixed particulate material into a third and fourth group of mixed particulate material by pulling at least a portion of the third group of mixed particulate material up and out of the second mixed particulate material separating apparatus and allowing the fourth group of mixed particulate material to fall from the second mixed particulate material separating apparatus; and

the air compressor further adapted to provide a third flow of air into a third mixed particulate material separating apparatus, whereby a third vacuum is created through the

venturi effect in the third mixed particulate material separating apparatus, the third vacuum causing the fourth group of mixed particulate material to enter the third mixed particulate material separating apparatus and separate the fourth group of mixed particulate material into a fifth and sixth group of mixed particulate material by pulling at least a portion of the fifth group of mixed particulate material up and out of the third mixed particulate material separating apparatus and allowing the sixth group of mixed particulate material to fall from the third mixed particulate material separating apparatus.

9. The apparatus for separating a mixed particulate material into particles of at least four different specific gravities according to claim 8, wherein:

the first group of particulate material comprises at least a portion of a mixed particulate material of the lowest specific gravity;

the second group of particulate material comprises mixed particulate material of the three highest specific gravities and the remainder of the mixed particulate material of the lowest specific gravity;

the third group of particulate material comprises at least a portion of a mixed particulate material of the two lowest specific gravities;

the fourth group of particulate material comprises mixed particulate material of the two highest specific gravities and the remainder of the mixed particulate material of the two lowest specific gravities;

the fifth group of particulate material comprises at least a portion of a mixed particulate material of the three lowest specific gravities; and

the sixth group of particulate material comprises mixed particulate material of the highest specific gravity and the remainder of the mixed particulate material of the three lowest specific gravities.

10. The apparatus for separating a mixed particulate material into particles of at least four different specific gravities according to claim 8, wherein:

the first mixed particulate material separating apparatus comprises:

a first angle of entry connection adapted to provide mixed particulate material to a first separation chamber;

a first connecting hose connected at a first end to a top of the first separation chamber, and at a second end to a first end of a first discharge tube; and

the air compressor is connected to the first discharge tube by at least one or more hoses, whereby a first vacuum is created through the venturi effect in the first angle of entry connection, separation chamber and connecting hose; and

the second mixed particulate material separating apparatus comprises:

a second angle of entry connection adapted to provide the second group of mixed particulate material to a second separation chamber;

a second connecting hose connected at a first end to a top of the second separation chamber, and at a second end to a first end of a second discharge tube; and

the air compressor is connected to the second discharge tube by at least one or more hoses, whereby a second vacuum is created through the venturi effect in the second angle of entry connection, separation chamber and connecting hose; and

the third mixed particulate material separating apparatus comprises:

a third angle of entry connection adapted to provide the third group of mixed particulate material to a third separation chamber;

a third connecting hose connected at a first end to a top of the third separation chamber, and at a second end to a first end of a third discharge tube; and

the air compressor is connected to the third discharge tube by at least one or more hoses, whereby a third vacuum is created through the venturi effect in the third angle of entry connection, separation chamber and connecting hose.

11. The apparatus for separating a mixed particulate material into particles of at least four different specific gravities according to claim 10, wherein:

the first, second and third angle of entry connection connected to the first, second and third separation chambers respectively have an angle of connection between each angle of entry connector and its respective separation chamber between 40° and 50°.

12. The apparatus for separating a mixed particulate material into particles of at least four different specific gravities according to claim 10, wherein:

the first, second and third angle of entry connection connected to the first, second and third separation chambers respectively, have an angle of connection between each angle of entry connector and its respective separation chamber at or about 45°.

13. The apparatus for separating a mixed particulate material into particles of at least four different specific gravities according to claim 10, further comprising:

a first, second and third air adjustment valves attached to each discharge tube, adapted to adjust the flow of air through each discharge tube.

14. The apparatus for separating a mixed particulate material into particles of at least four different specific gravities according to claim 10, further comprising:

a first, second and third automatic valve unloader assembly connected to the bottom of the respective discharge tubes, adapted to release mixed particulate material not discharged through the respective discharge tube according to a predetermined amount of mixed particulate material.

15. The apparatus for separating a mixed particulate material into particles of at least four different specific gravities according to claim 14, wherein:

the first, second and third automated unloader valve assembly connected to the bottom of the respective discharge tubes, comprises:

a valve servo;

a level sensor; and

an unloader valve;
and wherein the apparatus for separating a mixed particulate material further comprises:
a computer adapted to control operation of the automated unloader valve, wherein the computer is programmed to determine when to allow separated mixed particulate material to be discharged by operation of the automated unloader valve.

16. The apparatus for separating a mixed particulate material into particles of at least four different specific gravities according to claim 12, wherein:

the first vacuum is less than the second vacuum, and the second vacuum is less than the third vacuum.

17. A method for separating mixed particulate material into particles of at least two different specific gravities, comprising:

providing a flow of air from an air flow source through a mixed particulate material separating apparatus, causing a vacuum to occur whereby mixed particulate material enters the mixed particulate material separating apparatus; and

separating the mixed particulate material into a lower specific gravity and a higher specific gravity by the vacuum pulling the lower specific gravity material up and out of the mixed particulate material separating apparatus, and allowing the higher specific gravity material to fall from the mixed particulate material separating apparatus.

18. The method for separating mixed particulate material into particles of at least two different specific gravities according to claim 17, further comprising:

providing the mixed particulate material to the mixed particulate material separating apparatus.

19. The method for separating mixed particulate material into particles of at least two different specific gravities according to claim 18, further comprising:

collecting the material with a higher specific gravity at a bottom of the mixed particulate material separating apparatus; and

releasing the collected material with a higher specific gravity at a predetermined interval of time.

20. A method for separating mixed particulate material into particles of at least two different specific gravities, comprising:

providing a first flow of air from an air flow source through a first mixed particulate material separating apparatus, causing a vacuum to occur whereby mixed particulate material enters the mixed particulate material separating apparatus;

separating initially the mixed particulate material into a lower specific gravity and a higher specific gravity by the vacuum pulling at least a portion of the lower specific gravity material up and out of the first mixed particulate material separating apparatus, and allowing an initially separated mixed particulate material which comprises the higher specific gravity material and remainder of the lower specific gravity material to fall from the mixed particulate material separating apparatus;

moving the initially separated mixed particulate material to a second mixed particulate material separating apparatus;

providing a second flow of air from the air flow source to the second mixed particulate material separating apparatus; and

separating further the mixed particulate material into a lower specific gravity and a higher specific gravity by the second flow of air discharging at least a portion of the remainder of the lower specific gravity material up and out of the second mixed particulate material separating apparatus, and allowing the higher specific gravity material to fall from the second mixed particulate material separating apparatus.

21. The method for separating mixed particulate material into particles of at least two different specific gravities according to claim 20, further comprising:

transporting the higher specific gravity material away from the second mixed particulate material separating apparatus.

22. The method for separating mixed particulate material into particles of at least two different specific gravities according to claim 20, further comprising:

creating a vacuum in the first mixed particulate material separating apparatus by the venturi effect created by forcing air through the first mixed particulate material separating apparatus; and

providing the mixed particulate material to the first mixed particulate material separating apparatus because of the vacuum.

23. The method for separating mixed particulate material into particles of several different specific gravities according to claim 20, wherein the step of moving the initially separated mixed particulate material to a second mixed particulate material separating apparatus comprises:

transporting the initially separated mixed particulate material to a second discharge tube, comprising a first end, second end and a hopper.

24. A method for separating mixed particulate material into particles of at least four different specific gravities, comprising:

providing a first flow of air from an air flow source through a first mixed particulate material separating apparatus, causing a vacuum to occur whereby mixed particulate material enters the first mixed particulate material separating apparatus;

separating initially the mixed particulate material into a first group and a second group of mixed particulate material by the vacuum pulling at least a portion of the first group of mixed particulate material up and out of the first mixed particulate material

separating apparatus, and allowing the second group of mixed particulate material to fall from the first mixed particulate material separating apparatus;

providing a second flow of air from an air flow source through a second mixed particulate material separating apparatus, causing a vacuum to occur whereby the second group of mixed particulate material enters the second mixed particulate material separating apparatus;

separating secondly the second group of particulate material into a third and fourth group of mixed particulate material, by the vacuum pulling the third group of mixed particulate material up and out of the second mixed particulate material separating apparatus, and allowing the fourth group of mixed particulate material to fall from the mixed particulate material separating apparatus;

providing a third flow of air from an air flow source through a third mixed particulate material separating apparatus, causing a vacuum to occur whereby the fourth group of mixed particulate material enters the third mixed particulate material separating apparatus; and

separating thirdly the fourth group of particulate material into a fifth and sixth group of mixed particulate material, by the vacuum pulling the fifth group of mixed particulate material up and out of the third mixed particulate material separating apparatus, and allowing the sixth group of mixed particulate material to fall from the mixed particulate material separating apparatus.

25. The method for separating mixed particulate material into particles of at least four different specific gravities according to claim 24, wherein:

the first group of particulate material comprises at least a portion of a mixed particulate material of the lowest specific gravity;

the second group of particulate material comprises mixed particulate material of the three highest specific gravities and the remainder of the mixed particulate material of the lowest specific gravity;

the third group of particulate material comprises at least a portion of a mixed particulate material of the two lowest specific gravities;

the fourth group of particulate material comprises mixed particulate material of the two highest specific gravities and the remainder of the mixed particulate material of the two lowest specific gravities;

the fifth group of particulate material comprises at least a portion of a mixed particulate material of the three lowest specific gravities; and

the sixth group of particulate material comprises mixed particulate material of the highest specific gravity and the remainder of the mixed particulate material of the three lowest specific gravities.